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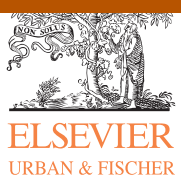

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The impact of recanalization on ischemic stroke outcome: A clinical case presentation

Silva Andonova[a,*], **Filip Kirov**[a], **Chavdar Bachvarov**[b]

[a] *Second Clinic of Neurology, St. Marina University Hospital, Varna, Bulgaria*
[b] *Centre of Radiology, St. Marina University Hospital, Varna, Bulgaria*

KEYWORDS
Ischemic stroke;
Recanalization;
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Summary
Background and purpose: Stroke remains the third most common cause of death in industrialized nations, and the single most common reason for permanent disability. Intravenous thrombolysis (IVT) with recombinant tissue plasminogen activator (rtPA, Alteplase) for the treatment of acute ischemic stroke within 4.5 h of onset is becoming a worldwide conventional standard of care. Thrombolytic stroke therapy is based on the ''recanalization hypothesis'' that reopening of occluded vessels improves clinical outcome in acute ischemic stroke through regional reperfusion and salvage of threatened tissues. However, intravenous thrombolysis is successful in approximately one-third of patients. Thrombaspiration through either a microcatheter, or a guiding catheter may be an option for a fresh nonadhesive clot. The use of mechanical thrombectomy devices in patients experiencing ischemic stroke and reocclusion after intravenous thrombolysis can now gain approval on the basis of recanalization, demonstrating better recanalization rates.
Case description: We present a clinical case of IVT followed by re-occlusion, and intra-arterial thrombaspiration and stenting.
Results: After IVT was started, a significant improvement of the neurological deficit was observed. After the end of the fibrinolysis, the patient had severe deterioration of the symptoms. The patient underwent control CT of the head to exclude intracerebral hemorrhage — the CT was normal. Through a guiding catheter thrombaspiration and stenting was performed with effective reperfusion with reversal of the neurological deficits.
Conclusions: Revascularization remains the most intuitive strategy to reverse ischemic injury associated with arterial occlusion in acute strokes. This case represents a valuable example of two recanalization therapies in acute ischemic stroke to improve clinical outcome by restoring anterograde perfusion and salvaging the ischemic brain.

Background and purpose

Despite the substantial advances in preventive and treatment strategies, stroke still remains the third most common cause of death in industrialized nations, and the single most common reason for permanent disability [1,14]. Bulgaria is

* Corresponding author at: Department of Neurology, St. Marina University Hospital, 1 HristoSmirnenski St., Varna 9010, Bulgaria. Tel.: +359 52 978236.
E-mail address: drsilva@abv.bg (S. Andonova).

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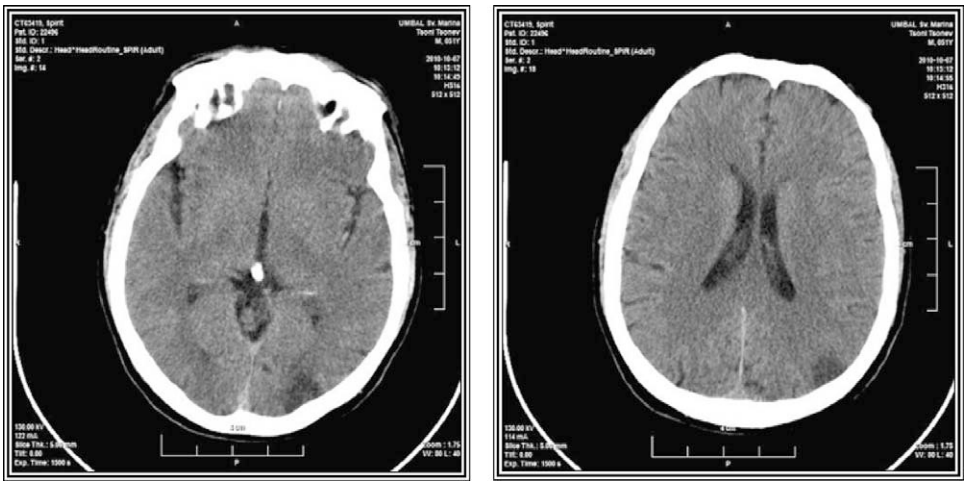

Figure 1 Brain CT.

the worst example in the European Union, by heading the list of stroke mortality [13].

Intravenous thrombolysis (IVT) with recombinant tissue plasminogen activator (rtPA, Alteplase) within 4.5 h of stroke onset is now the worldwide standard of care [7].

However, the cumulated experience from IVT reveals some substantial drawbacks: short time window, long list of exclusion criteria, and more importantly — a not negligible rate of no treatment effect or re-occlusion [5]. The only possible solution in the latter case is an attempt for rapid intra-arterial recanalization [3,4,9,11,14].

Case description

We present a clinical case of IVT followed by re-occlusion, and intra-arterial thrombaspiration and stenting.

A 51 years old male was admitted in the emergency department at 07:50 with dextral hemiparesis and speech difficulties. The patient has had diabetes mellitus type II for 5 years with good control without treatment, and arterial hypertension treated with ACE-inhibitor. His wife reported the symptoms appeared at 06:50 when preparing to leave for work. Brain CT (at 08:30) revealed a hypodense area in the left occipital region. The color-coded duplex sonography revealed this as high grade stenosis of the left internal carotid artery (Fig. 1).

He was transferred to the Neuro-Critical Care Unit for IVT. At the start of the infusion — an intravenous rt-Pa by protocol: body weight $\times$ 0.9 mg/kg rt-PA — with 10% bolus and i.v. infusion for 60 min, (on 08:39) his NIHSS was 8 points. At 09:10 the patient showed clinical improvement with NIHSS = 5 p., but at 09:40, at the end of the rt-Pa infusion, the patient became suddenly hemiplegic and aphasic. His NIHSS was 15. The second brain CT did not show any differences from the previous one (Fig. 2).

A decision was made for an immediate attempt for intra-arterial recanalization, after obtaining a written informed consent from his wife. Cerebral angiography with right-sided femoral access was started at 10:36, revealing an occlusion of the left internal carotid artery. A mechanical thrombaspiration with 20 cc syringe was successfully performed leading to recanalization at 11:32. As there was a significant stenosis on the place of the occlusion a self-expandable stent was placed at 11:45. The patient's improvement started a few minutes later with NIHSS — 12 at 11:45, and 6 at 12:00.

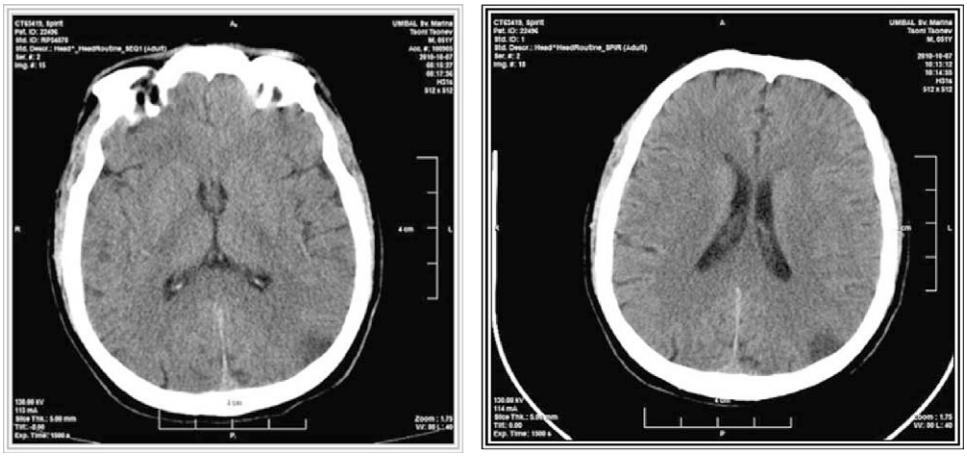

Figure 2 Control CT (10.15 h) to exclude intracerebral hemorrhage NIHSS = 15.

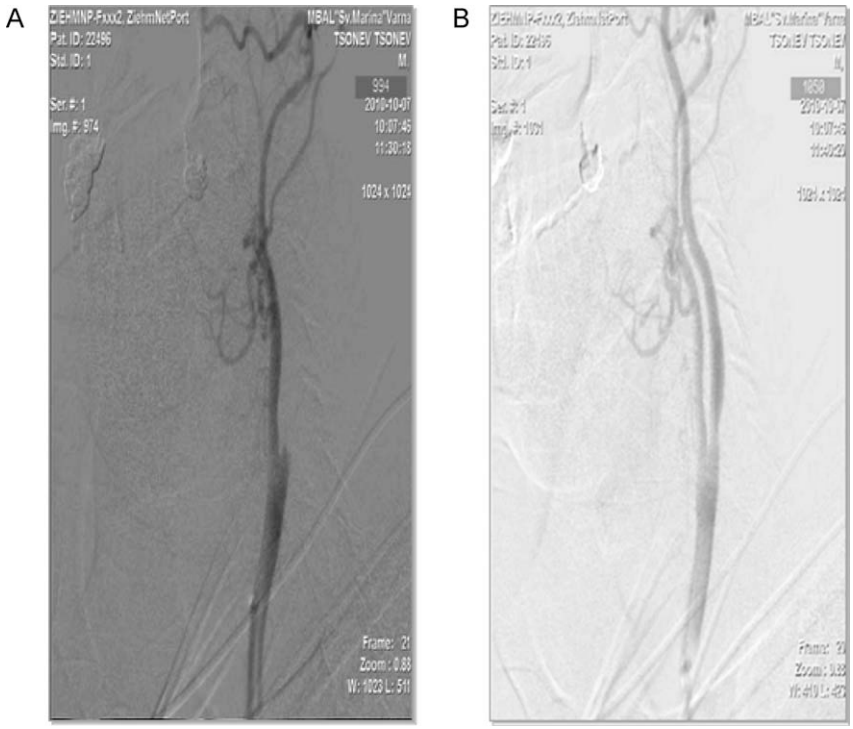

Figure 3 Digital subtraction angiography: (A) thrombosis of the left internal carotid artery; (B) after thrombaspiration and stent with effective reperfusion.

Brain CT showed small hemorrhagic infarction in the left hemisphere. The patient was discharged after five days with motor dysphasia and NIHSS of 3. Three months later he had recovered completely (Figs. 3—5).

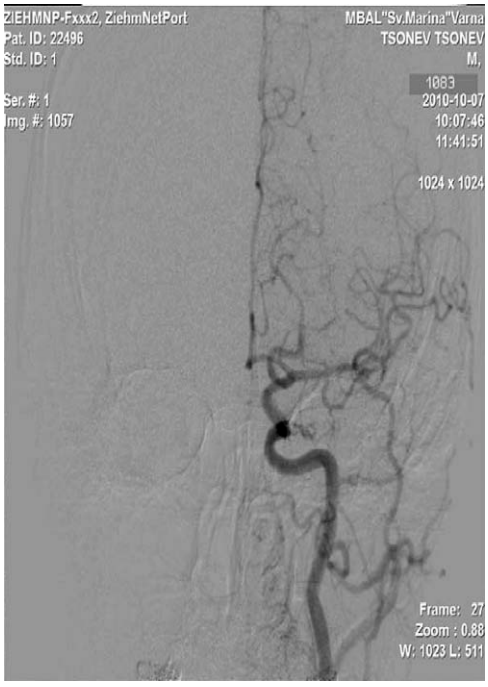

Figure 4 Intracranial image of left carotid artery after fibrinolysis, thrombaspiration and stenting.

Revascularization remains the most intuitive strategy to reverse ischemic injury associated with arterial occlusion in acute strokes. Revascularization may lead to opening of an occluded artery, or recanalization, yet restoration of downstream flow, or reperfusion, may not ensue.

This case represents a valuable example of two recanalization therapies in acute ischemic stroke to improve clinical outcome by restoring anterograde perfusion and salvaging the ischemic brain.

Discussion

The potential role of intravenous thrombolysis for recanalization of various occlusion sites has also been examined in depth [6]. In the Echoplanar Imaging Thrombolytic Evaluation Trial, intravenous tissue plasminogen activator administered in the 3—6-h time window showed poor recanalization of intracranial carotid artery (ICA) lesions and far better results with middle cerebral artery (MCA) occlusions [6]. Intra-arterial recanalization in acute ischemic stroke is nowadays the second option for saving the ischemic brain after the officially recognized IVT, and is a landmark for experienced and advanced acute stroke centers worldwide [2,10,12]. Several methods and a substantial arsenal of devices and systems are currently in use routinely or under investigation in different trials [9,14]. Mechanical thrombaspiration with a syringe in acute stroke is today more likely a topic from the history of endovascular treatment [8,11]. Most case series have been published in the last 15 years with promising results, but so far there is no data from clinical trials [12]. For Bulgaria this is one of the few known clinical cases of successful recanalization in acute stroke.

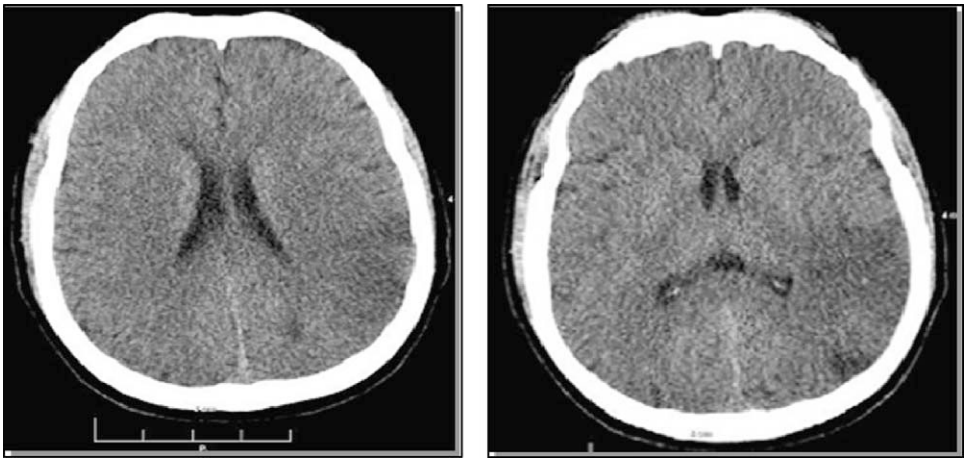

Figure 5 Second control CT (24 h after the onset) — ischemic zone in left parietal lobe; with reversal of neurological deficits — NIHSS 3 points.

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